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No. 11: BAIRD'S SPARROW, BY B. W. CARTWRIGHT,
T. M. SHORTT AND R. D. HARRIS.

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BAIRD'S SPARROW*

By B. W. CARTWRIGHT, T. M. SHORTT and R. D. HARRIS

Introduction

The discovery of a small breeding colony of Baird's sparrows (*Ammodramus bairdi* [Aud.]) two miles north of Deer Lodge, a suburb of Winnipeg, Manitoba, Canada, in August, 1928, gave the authors an opportunity to plan a life history study. This was duly carried out during the summers of 1929, 1930 and 1931. As the breeding habits of this species were heretofore practically unknown, it was thought advisable to extend the study to embrace in one publication as comprehensive a treatment as a search of the literature and correspondence with active ornithologists would allow. This has been done.

Acknowledgments

We have not hesitated to ask the help of others and this has been generously given. In specific instances acknowledgment is made at the appropriate place in the text. To the following gentlemen and the institutions they represent we express our appreciation for aid rendered:

The late Prof. H. P. Attwater, Dr. R. M. Anderson (National Museum of Canada), Mr. J. Hooper Bowles, Mr. F. Bradshaw (Saskatchewan Provincial Museum), Major Allan Brooks, Dr. Frank M. Chapman (American Museum of Natural History), the late Mr. Norman Cridle, Mr. A. Dawes DuBois, Prof. J. R. Dymond (Royal Ontario Museum of Zoology), Rev. C. F. G. Eifrig, Mr. Morton J. Elrod, Mr. J. H. Fleming, Dr. Herbert Friedman, Mr. Ira N. Gabrielson, Dr. Joseph Grinnell (University of California Museum of Vertebrate Zoology), Mr. A. D. Henderson, Mr. Chas. T. Holme, Mr. Stanley G. Jewett, Mr. Frederic H. Kennard (Museum of Vertebrate Zoology), Mr. Hamilton M. Laing, Mr. A. G. Lawrence, Mr. Chas. W. Lowe, Mr. Gale W. Monson, Mr. J. A. Munro, Dr. H. C. Oberholser (United States Bureau of Biological Survey), Rev. P. B. Peabody, Mr. Harold S. Peters, Mr. L. B. Potter, Mr. Thos. E. Randall, Mr. S. F. Rathbun, Mr. J. H. Riley (United States National Museum), Dr. Thos. S. Roberts (University of Minnesota Zoological Museum), Dr. William Rowan, Mr. W. E. Saunders, Mr. Angus H. Shortt (Manitoba Museum), Dr. J. C. Simms

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(Field Museum of Natural History), Mr. L. L. Snyder (Royal Ontario Museum of Zoology), Dr. Witmer Stone (Academy of Natural Sciences of Philadelphia), Mr. J. K. Strecker, Dr. H. S. Swarth (California Academy of Sciences), Prof. Myron H. Swenk, Mr. P. A. Taverner (National Museum of Canada), Mr. W. E. Clyde Todd (Carnegie Museum), Mr. Edward R. Warren, Dr. Alexander Wetmore (Smithsonian Institution), Mr. W. H. Williams. To all others who replied to our questionnaire (negative information is valuable) we also extend our thanks. For the typing of the final manuscript our thanks are due to Mrs. R. R. Gray.

HISTORICAL ACCOUNT

Baird's sparrow was discovered by Audubon and party near the mouth of the Yellowstone river, North Dakota, on July 26, 1843. The type specimen is No. 1855 in the United States National Museum and is labelled "Ft. Union, Nebraska, July 26, 1843". Audubon named it *Emberiza Bairdii* in honour of Spencer Fullerton Baird, who later became Secretary of the Smithsonian Institution and founder of the United States National Museum. A male and female were collected at this time and from their behaviour Audubon concluded they were on their breeding grounds.

Twenty-nine years elapsed before the species was again encountered by ornithologists and when it was re-discovered by Aikin, eleven miles east of Fontaine, El Paso Co., Colorado, on October 9, 1872, he thought he had a new species. Ridgway shared his views and named the bird *Centronyx ochrocephalus*, the type specimen being No. 162696 in the United States National Museum. It was later shown that the difference between Audubon's *Emberiza Bairdii* and Ridgway's *Centronyx ochrocephalus* was due to seasonal plumage changes. The following year Coues found them breeding abundantly in North Dakota, collected about 75 specimens, secured young birds and made many field observations. Coues supplied the principal museums with specimens for the first time and in the fall of that year, 1873, Henshaw encountered them in great abundance in Arizona and also secured many specimens. We see, then, that following a hiatus of nearly thirty years, in one year—October, 1872, to October, 1873—the breeding range, migration routes, winter quarters, nest and eggs, plumage changes and juvenal plumage were all more or less established. Since then little has been added to knowledge of the species. Specimens have been taken from time to time by various field workers who have extended the breeding range considerably and defined the migration routes, but the life history has remained virtually a closed book. In the following pages we hope to fill in some of the missing leaves.

Distribution

BREEDING RANGE

The accompanying map (Fig. 1) clearly defines the breeding range as we have compiled it from actual nests found and specimens taken during the breeding season. The southern breeding limits, as at present known, are in northwestern South Dakota; eastern limit—northwestern Minnesota; western limit—in the foothills of the Rocky Mountains in south-central Alberta south to central Montana. The northern limits closely follow latitude 53 degrees in Manitoba, Saskatchewan and Alberta. It is a characteristic breeding species of suitable grassy locations bordering low places on the prairies, where snow water lingers in spring, throughout North Dakota, south-central and western Manitoba, southern Saskatchewan and southern Alberta.

TRANSIENT RANGE

Spring Migration

We have purposely arranged the list of specimens (Table VI) from January to December to show the passage from south to north and return. This was necessary because migration data are so meagre as to be almost negligible (see Tables I and II). In migration the species seems largely to escape observation. It is an abundant spring migrant through southeastern Arizona in February, March and April, rare in New Mexico and southwestern Texas. Colorado and Nebraska observers but rarely record it in spring and it is evident that the passage through these states is very rapid. Brooks and Law found the species fairly common at Rodeo in the extreme southwestern part of New Mexico on April 29, 1913 (Bailey 1928). Swarth (1904) reports it as late as May 3 in Arizona but by May 5 it is reported on its breeding grounds in North Dakota. The average dates of arrival in North Dakota and Manitoba are May 10th and 11th respectively (see Table I).

Autumn Migration

The autumn migration substantially follows the spring route except for a slight westerly shift as indicated by increased records from eastern Montana, Nebraska and New Mexico. This shift may be more apparent than real as it is clear that the autumn migration is long drawn out as compared with the spring movement. (See Fig. 1, and Tables I, II, and VI.)

Jones (1887) found the species as common in fall as in spring in

western Iowa, but Anderson (1907) says: "It sometimes occurs in Iowa during migration." Dumont (1933) removes the species to the hypothetical list of Iowa birds, since there are no existing specimens. Prof. Myron H. Swenk (*in litt.* 1930) considers it an uncommon migrant in Nebraska. Colorado provides many more autumn than spring records, but this may be due to the rapid spring passage of the species. (See Tables I, II and VI.)

TABLE 1. Spring Migration

Place	Year	Date First Seen	Date Last Seen	Average	Observer
Huachuca Mts., Ariz....	1903	Feb. 17	May 3		
Tucson, Ariz.....	1909			Late April	S. S. Visher
Gila R., N.M.....	1913	Apr. 28			Brooks and Law
Cohise Co., Ariz.....		Feb. 17	May 4		H. S. Swarth
Central Missouri.....	1895	Mar. 17		Mar. 21	
St. Joseph, Mo.....	1896		May 25		
Gainsville, Tex.....			Apr. 24		
El Paso Co., Col.....	1873	May 6			
Terry, Mont.....	1894	May 2			
White Earth, Minn.....	1885	May 5			
Argusville, N.D.....	1927	May 12			
" "	1929	May 25		May 10	Gale W. Monson
" "	1930	May 6			
Harrisburg, N.D.....	1904	May 5			
Billings Co., N.D.....		Apr. 25			Adrian Larsen
Kittson Co., N.D.....		May 10			P. B. Peabody
Whitewater L., Man....	1924	May 15		May 14	
" " ...	1925	May 12			
" " ...	1926	May 5			
Aweme, Man.....	1906	May 11		May 11	C. G. Harrold
" "	1907	May 12			
" "	1909	May 11			
" "	1916	May 7			
" "	1923	May 15			
" "	1930	May 4			
St. James, Man.....	1929	May 28			T. M. Shortt
Belmont, Man.....	1922	Apr. 28			J. C. Wilson
Castor, Alta.....	1923	May 10			T. E. Randall

The autumn migration of Baird's sparrow presents rather remarkable features. Both male and female specimens are recorded (see Table VI) from New Mexico on August 4, 7, 10, 11 and 12 and from Arizona from August 16 *et seq.* During this month they are still on their breeding

grounds in apparently undiminished numbers in southern Canada and North Dakota. Moreover they are still breeding or attending young for at least the first fifteen days of the month and to as late as August 25. By this latter date, however, many of the breeding birds have disappeared and only those with belated nests are in evidence. Our experi-

TABLE II. Autumn Migration

Place	Year	Date First Seen	Date Last Seen	Average	Observer
St. James, Man.....	1929		Sept. 10		T. M. Shortt
" "	1930		Aug. 27		T. M. Shortt
" "	1931		Sept. 12		R. D. Harris
Aweme, Man.....	1907		Oct. 5		N. Criddle
Aweme, Man.....	1908		Oct. 3		N. Criddle
N.E. North Dakota.....	1914		Oct. 7		H. V. Williams
Billings Co., N.D.....	1924		Oct. 21		A. Larsen
Custer Co., Mont.....	1893			Sept.	E. S. Cameron
Terry, Mont.....	1902	Sept. 6	Sept. 10		E. S. Cameron
Dawson Co., Mont.....	1905			Sept.	E. S. Cameron
Harding Co., S.D.....				End Aug. Early Sept.]	S. S. Visher
St. Charles, Mo.....	1894		Oct. 18		
Colo. Springs, Col.....	1914	Nov. 26			E. R. Warren
East. Arizona.....	1874	Aug. 16			
South. Arizona.....	1884	Aug. 29			
Santa Cruz Co., Ariz....	1927	Oct. 1	Oct. 10		H. S. Swarth
San Luis, Colo.....	1874	Aug. 22			
Upper Pecos, N.M.....	1903	Aug. 11			
Las Vegas, N.M.....	1903	Sept. 2			
San Juan Mts., N.M....	1904	Sept. 7			
Bonham, Texas.....	1889		Nov. 5		
Huachuca Mts., Ariz....	1907		Oct. 24		

ences convince us that August is a regular breeding month of the species and such breeding records are not to be taken as at all unusual (see Table III.)

With regard to the August specimens from New Mexico, it is surprising to find that the majority come from high altitudes—5,000 to 12,000 feet, Bailey (1928). In this connection Brewster (1885) draws attention to two adult males in worn breeding plumage taken on August 29 and 30 and remarks that the date of capture and state of plumage implies that the species breeds in Arizona. Henshaw (1885) also remarks on two specimens secured by him in extremely worn plumage, being, in

this respect, similar to many specimens secured by him in Arizona in 1873. He believed from this that they spent the summer not far away,

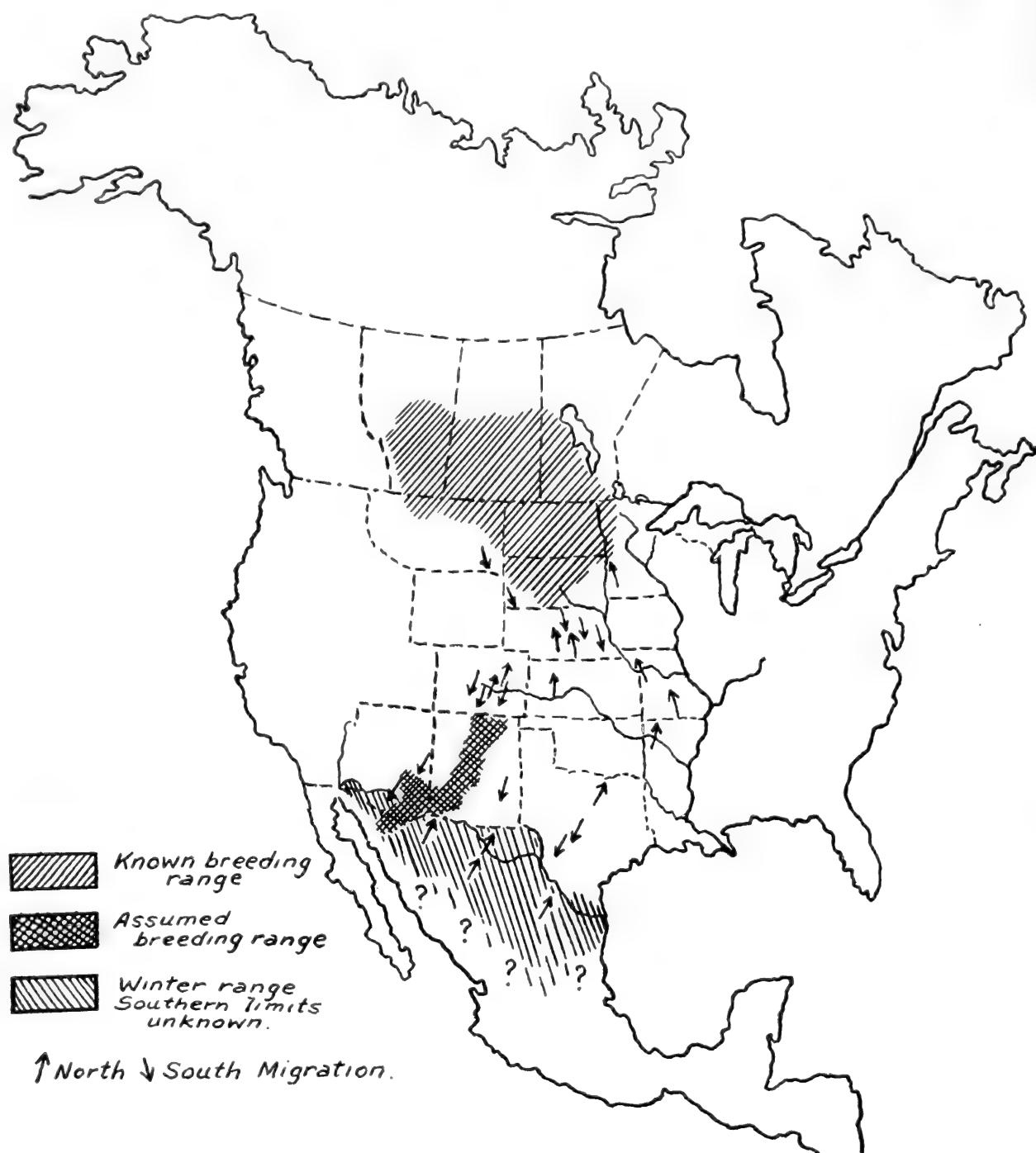


FIGURE 1.

as they could not have migrated far in such plumage. Drew (1885) under Baird's sparrow, gives the following data without any supporting evidence — "Spring, 5,000 ft.; Summer, 8,000 ft.; Fall, 7,000 ft." Strecker (1912)

gives—"Recorded by McCauley as breeding in northern Texas (Canyon City)." Strecker (*in litt.* 1931) considers this record as doubtful. In R. M. Barnes' collection, lodged in the Field Museum at Chicago, there is a nesting record of 4 eggs, labelled "Utah, Fort Douglas, June 11, 1900, W. H. Parker". These have been examined by Clarence Cottam of Washington, and he is convinced that they are a misidentification.

W. A. Strong of San Jose, Calif., kindly submitted a set of 4 eggs to us for examination with the following data—"545 2/4 June 6, 1916, Baird's sparrow, coll. E. W. Yeates, Tarrant Co., Texas, fresh, female seen." These eggs did not resemble Baird's sparrow's eggs as we are familiar with them in Manitoba, either in size (they were larger) ground colour or markings and, while we were unable to identify the eggs, we definitely concluded they were not those of Baird's sparrow. Caution dictates that we treat all these breeding records as erroneous but we cannot dismiss the possibility suggested by the entire evidence presented above, that there might be a high altitude breeding range of Baird's sparrow in the states mentioned (see Fig. 1). This possibility is heightened by the fact that grassy plains suitable for the species are a topographical feature of these localities.

On the other hand, Bendire's breeding record at Camp Harney, Oregon (1877), a set of 4 eggs, No. 19957 in the United States National Museum, has satisfactorily been proved to be a misidentification. Dr. Wetmore writes (Oct., 1930), "In compliance with your request Mr. J. H. Riley has looked into the matter very thoroughly and makes the following statement:—"This set is undoubtedly misidentified, despite the fact that one of the parents was shot, but apparently not saved. The eggs have been compared with the Nevada savanna sparrow but they do not belong to it. They are more like the eggs of the western vesper sparrow, though a little small, and *probably* belong to it. At the time Bendire wrote, Baird's sparrow was not very well known'."

Dawson (1897a) remarks re fall migration of 1895 at Chelan, Okanagan Co., Washington:—"First seen on Sept. 5, last seen Sept. 9. Were abundant on weedy bottom lands along lower end of lake Chelan. Seemed to be feeding on a little wild bean." The spring movement is less noticeable. "On April 29-1896 found about a dozen in sage brush of an upland pasture, mixing freely with *Zonotrichia leucophrys intermedia*. An elegant male with yellow areas in maximum colour, was taken from a willow clump by water's edge on May 11." We have not been able to trace this specimen, nor is Baird's sparrow in maximum colour in May. Messrs. Stanley G. Jewett, Ira N. Gabrielson, F. R. Decker and J. Hopper Bowles, who are well acquainted with the territory in question, unite in stating that no authentic record of Baird's sparrow exists for either

Oregon or Washington. The first two mentioned gentlemen are well acquainted with our subject and have collected specimens in North Dakota. In view of the above we have no option but to treat Dawson's observations as errors of identification.

WINTER RANGE

The winter range is practically unknown. There are no November or December records in any of the principal museums except an aberrant November record from Montauk point, Long Island, New York—many hundreds of miles from its normal range. There is one January record from Roswell, New Mexico, and several early February records from Arizona. Bailey (1928) states definitely that none winter in that state, but Swarth (1914) considers "a few probably remain through the winter" in Arizona. Strecker (1912) says it winters in the trans-Pecos country and Lloyd (1887) states, "winters abundantly west of Tom Green Co." These localities are both in Texas. Mexican records are confined to the northern provinces of Sonora, Chihuahua, and Coahuila but are too few (see Table VI), and the dates are such as to suggest migrants. Three records are from near the southern boundaries of Chihuahua and Coahuila. It is not improbable that the main wintering ground is to the south of these provinces. Cottam (1928) records three seen on Dec. 24 at Provo, Utah, but a communication from him reveals that the note was in error and should have referred to LeConte's sparrow.

CASUAL OCCURRENCE

As there are remarkably few casual records they are listed and commented upon here. The juvenile specimen taken by Helme on Long Island, N.Y. (1900) was examined by Dr. J. Dwight and found to be passing from juvenal into first winter plumage. This is the only known record east of the Mississippi. M. M. and L. B. Nice (1924) mention a specimen taken in north-western Arkansas on March 23, 1914 and Baerg (1931) refers to the same specimen, giving the locality as Winslow. Mrs. Nice (*loc. cit.*) says there is no record for the state of Kansas and Wetmore (1920) makes the same statement. We find, however, specimen No. 155884 listed in the collection of the U.S. Biological Survey from Pendennis, Kansas, April 25, 1897, J. A. Loring. This record, which probably has never been published, appears to be the first and only one for that state. This can hardly be termed a casual occurrence as a glance at the map will show. The species is probably a regular migrant through the western part of Kansas, as was pointed out by Wetmore (*loc. cit.*).

Field Identification

Baird's sparrow seems to be so frequently overlooked by ornithologists, even on its breeding ground, that a few remarks on the field identification of the species may not be out of place.

The song, when known, affords the most dependable method of detecting the presence of Baird's sparrow. It is more often than not overwhelmed by the songs of savannah sparrows and chestnut-collared longspurs which are territorial associates of the species in all parts of its breeding range. As a rule, it is numerically inferior to these. It lacks entirely the spectacular flight song of the chestnut-collared longspur, but the terminal trill of Baird's sparrow's song has something of the tone and quality of the longspur's song. Wherever the longspurs and savannah sparrows are found breeding in company, particularly if Sprague's pipit is present also, Baird's sparrow should be looked for carefully.

The profile of Baird's sparrow is a good field mark. The bill and forehead make an almost continuous straight line, whereas that of the savannah sparrow shows a distinct change in contour. In contrast to the savannah sparrow, the head of Baird's sparrow does not appear crested. It has a tendency to compress, rather than raise the crown feathers when alarmed.

During the breeding season, at ordinary observing distance, say fifty feet, with eight power binoculars, Baird's sparrow shows little or no suggestion of buffiness or ochre about the face and neck (as might be expected from the appearance of the bird in the hand) but appears to be pale greyish, particularly about the face, neck and upper back. This is surprising as the effect is not noticeable in the hand. In comparison, the savannah sparrow is a much darker bird. The breast markings of Baird's sparrow are very sharply defined and form a necklace effect, sometimes with a tendency to concentrate in a central spot. When a low-flying Baird's sparrow alights, it frequently displays its pale greyish-brown outer tail feathers which appear whitish. Sprague's pipit and the chestnut-collared longspur also exhibit this mark, but as the outer feathers of these species are white, the difference in colour tone and also of pattern is distinctive of each and can be used as a means of identification. Of the three, Baird's sparrow shows the least light colour in the tail, Sprague's pipit the next least and the longspur the most.

COURTSHIP AND MATING

Two nesting colonies were under our observation in 1929 and 1930. The first one, discovered in August, 1928, near Deer Lodge, a western suburb of Winnipeg, Manitoba, being within easy reach of our homes,

received the bulk of our attention. This colony never was greater than about a dozen nesting pairs. The second colony was located about five miles west of the first one and near the village of St. Charles. In 1929 and 1930 this colony was much the larger and probably contained in excess of fifty nesting pairs. Its exact extent was never satisfactorily determined. In 1931, however, the birds were absent from St. Charles, but the Deer Lodge colony was about the same as before. During this last nesting season we had our greatest success due, no doubt, to the experience gained in the two previous years. For some unexplained reason the Deer Lodge territory was never occupied until well on in June and did not reach its full strength until late in the month. Nor did the males take up their territories in a body. They straggled in over a period of a week or ten days. The females were from three to seven days later in arriving. When the males arrive they select their territory and their regular singing perches are soon learned. The territory is quite extensive, much greater than that required by the savannah sparrow or Leconte's sparrow, but the boundaries are not sharply defined as they are later after nesting has started. When we discuss the nestings, special attention will be given to this very interesting question of territory.

Baird's sparrow does not have an ecstatic flight performance accompanied with song such as characterizes the chestnut-collared longspur, but on two occasions Baird's sparrow was observed to mount into the air in a series of looping upward flights—as if it were climbing invisible giant stairs—with a hovering pause between each upward thrust. No song was heard on these two occasions and a high wind prevailed each time. If this was a regular mating performance we would have seen it more often. The fact that a high wind prevailed on both occasions brought us to the decision that our advent had forced the birds into the air and that this type of flight was a reaction to high wind.

After mounting to a height of about fifty feet—the highest altitude that we have seen Baird's sparrow attain—it suddenly nose-dived to earth, as if its courage had suddenly failed on reaching such dizzy heights. On one occasion, June 27, 1931, one of us observed a male to fly to a little height and sing while on the wing.

A favourite rendezvous for nesting birds of different species is an old straw or haystack bottom and where such occurs, Baird's sparrow is sure to use it. One of us (T.M.S.) witnessed the real mating performance in such a situation on June 3, 1930. A male was observed acting strangely on a patch of matted straw. It was walking slowly along with head drawn in and tail slightly fanned; it vibrated first one and then the other wing rapidly over its back, resembling greatly the wing flutterings of a young bird about to be fed. It never vibrated both wings at once. It

bobbed its head to near the ground several times but made no sound during the performance. When it flew its wing-beats were abnormally fast and fluttering. It hardly seemed able to contain itself and had no sooner alighted on another patch before it recommenced the display.

Further examples of courtship performances were observed by one of us (R.D.H.) on June 27, 1931. Two singing males, whose territories adjoined, were frequently observed to invade each other's territory. A tussle then ensued and the invader was driven back to its own domain. They would sometimes pursue each other about erratically, often alighting, and sometimes fighting. The bird occupying the territory to the north of the other was found to be uttering a curious, soft, complaining whine, "*Meeerr, meeerr, meeerr, meeerr, meeerr,*" and so on. It was uttered either when the bird was on a bush, on the ground, or in low flight over the ground. The note was usually accompanied by wing flutterings when the bird was settled and by abnormally fast wing beats when in flight. Neither of these birds was seen on June 20. After three hours' watching on June 27, a female was seen. Pursued by both males, she flew from the territory of the southern male to that of the northern male. Near the boundary of the two she dropped into the grass, followed by both males. The southern male now returned to his own territory, however, while the other one followed the female as she flew into a patch of mixed wolfberry and silver willow. The female could not be found there. She was seen sometime later, however, again near the boundary of the two territories. Both males came to her and fought for a brief time and then dispersed.

When two nests of young are raised in a season, mating for the second laying takes place in the short interval between the departure of the young from the first nest and the beginning of the second set of eggs. If the pair remain mated for both nests, the singing of the male, which had become less frequent during the raising of the first brood, increases noticeably in frequency during this period. Other than his greater attention to singing, no further display from the male has been witnessed.

If another male mates with the female, however, the courtship is more elaborate. In the single case where this has been observed, the new male followed the female around as she attended to the young of the first nest. Often he would drop into the grass beside her, and then the "*meeerr*" note, previously mentioned, and a sharp "*kee-keep*" would usually be heard. The bird sang vigorously. The male of the previous nesting, on the other hand, sang little and was non-combative, allowing the new arrival to use his territory freely.

Habitat and Territory

SUMMER HABITAT

Baird's sparrow occupies the short-grass, native prairie sections of the transition life zone. While the species may be quite abundant where found, the range within its habitat is curiously restricted. Hamilton M. Laing (Mss.) describes it thus:—"Found only in meadow association and near lake or slough. It occupies, in cross-section, the strip between the habitat of the savannah sparrow and vesper sparrow—or Brewer's sparrow where this last occurs. The Nelson's and Leconte's sparrows hold to the marsh, the savannah to the damp grassy meadow, the Baird's to the dry edge of the meadow and the vesper to the dry prairie."

This description fits well with our experience except that the chestnut-collared longspur and Sprague's pipit adjoin Baird's sparrow on the driest portion of the prairie. The savannah sparrow overlaps Baird's sparrow's territory and shows no particular preference for the wet or dry places. It should be pointed out, however, that slight changes in the density of the vegetation is sufficient to make it unsuitable for Baird's sparrow. For instance, it will nest amongst sparse, dwarf wolfberry (*Symphoricarpos occidentalis*) but if the wolfberry is only slightly more crowded, even if no taller, Baird's sparrow will not nest there but the savannah sparrow will. Baird's sparrow will choose a singing perch in the denser wolfberry patches and their territories usually include one or more such patches.

Nesting Territories

Thus the nesting territories of Baird's and savannah sparrows frequently overlap in this manner but the relations between them are perfectly amicable.

Gale W. Monson, Argusville, North Dakota, who has observed Baird's sparrow on many occasions from 1927 to 1930, writes: ". . . partial to high, dry upland meadows, being very seldom seen in low, swampy places. It also likes weedy fields where there is a certain amount of grass. In dry years, however, it may be seen on the borders of slough-holes or other wet places." In this respect, we found, in the very dry summer of 1931, that Baird's sparrow nested in the long grass of the slough bottom in late July and August, the reason apparently being the need for a little underneath moisture to the nest.

At Castor, Alberta, Thos. E. Randall found nests and eggs in 1924 and 1925 (see Table VII). He describes the nesting locations as amongst patches of briar and buckbrush. Where such patches were found on the

prairie, the species was not uncommon—as many as twenty to thirty males could be heard singing at one time. He found that savannah sparrows and chestnut-collared longspurs were their immediate territorial associates. We have seen a photograph by Dr. Wm. Rowan of a nest found by him on Francis Point, Beaverhills lake, near Tofield, Alta., on June 9, 1931, which shows the location under a thick tuft of grass. He remarks that the birds were plentiful, outnumbering the savannahs by about two to one. Rev. P. B. Peabody found the species breeding in Hallock, Kittson Co., Minnesota, on level weedy prairie and his two North Dakota nestings in Benson Co. are described as on "hog-wallow" prairie.

For some unexplained reason the territory we have had under intensive observation is not occupied until towards the end of the first week in June and does not attain full strength until about ten days later. The males arrive at least three days before the females and nesting does not become general until the third week in June. The small colony under discussion here is the Deer Lodge colony. Five miles to the west is the much larger St. Charles colony. It was observed in 1929 and 1930 that the St. Charles colony was occupied at least a week before the species made its appearance at Deer Lodge. Further, it is of interest to note that Norman Criddle has recorded its arrival at Treesbank, Manitoba, as early as May 4, and C. G. Harrold at Whitewater lake, Manitoba, on May 5. The average spring migration date for Manitoba is May 11. Why do they not occupy their breeding grounds until a month later in this district? We have speculated a good deal about this, particularly the difference between colonies in such close proximity as those under our observation. It may be that unmated birds of both sexes leave the larger colony at St. Charles when it becomes evident that the available territory is fully occupied by paired birds, and repair to the next nearest suitable territory. The desultory way in which the birds straggle into the Deer Lodge territory supports this idea. In 1931, however, the St. Charles colony did not exist. It was a very dry year, but there was an abundance of food for their young. Sprague's pipit (*Anthus spraguei*) was there in even greater abundance than the two previous years. Moreover, there was no apparent difference in the conditions between the two territories and that of Deer Lodge was occupied as usual by about the same number of nesting pairs as before. We have not solved the problems presented by these curious time differences and desertion of territory and merely record them as observed facts.

TERRITORIAL REQUIREMENTS OF MATED PAIRS

As a relic of a prewar real estate boom, the territory occupied by Baird's sparrows was nicely laid out in roadways with ditches running

alongside. They had never been used as roads and formed equidistant ridges 285 feet apart, densely overgrown, for the most part, with dwarf

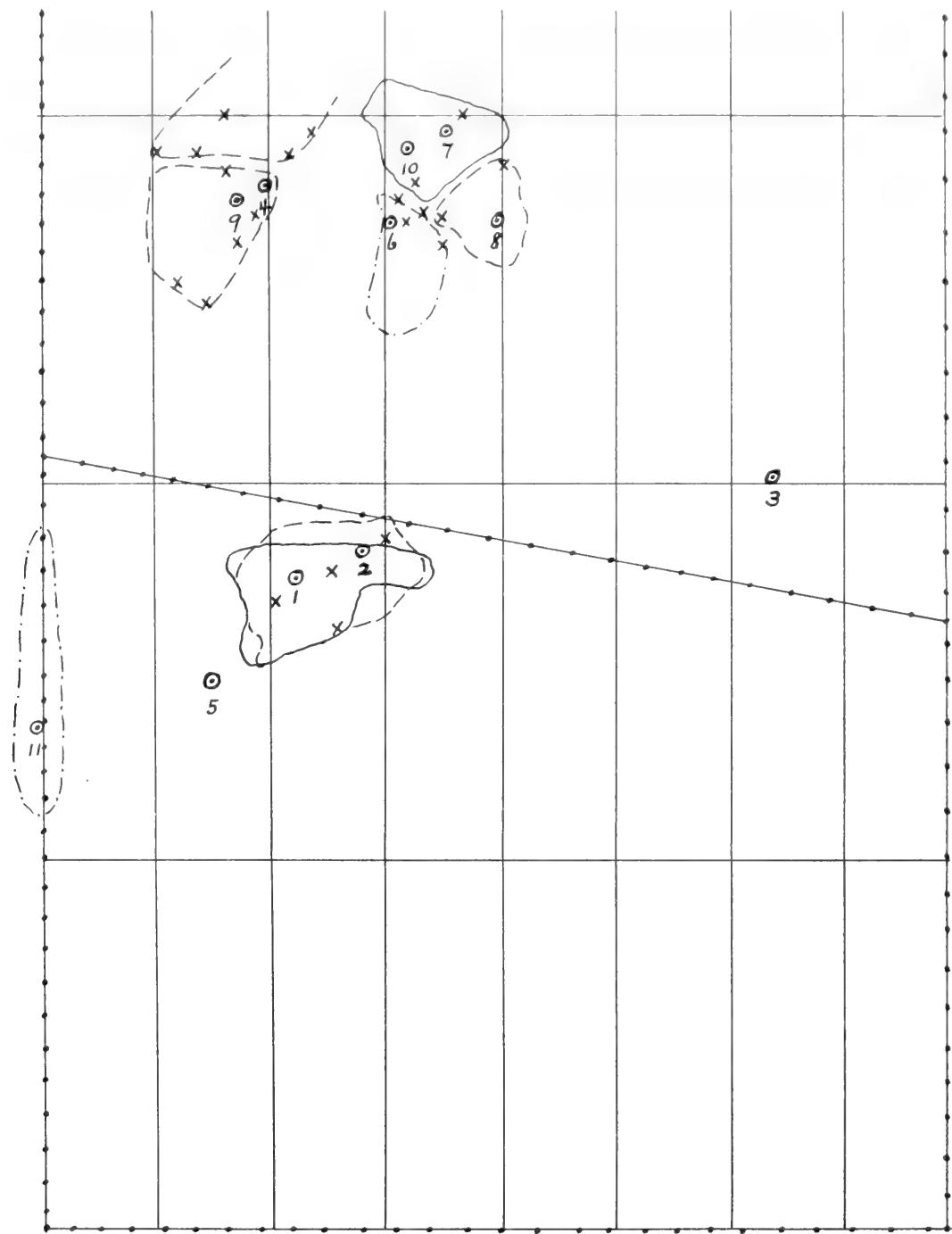


FIGURE 2.

wolfberry. There were, of course, many breaks in the continuity of this growth and where such occurred, coarse prairie grass and gumweed (*Grindelia squarrosa*) replaced the wolfberry. These ridges, standing two

or three feet above the surrounding level, provided desirable perches and cover for other prairie species as well as Baird's sparrow.

The diagram of nesting territories (Fig. 2) will clearly indicate the size of individual territories. The parallel lines running north and south and east and west represent the roadways mentioned above. The dotted lines bounding the diagram and those crossing it are fence lines. Nests 1 and 2 (1930), and 7 and 10 (1931) represent two broods raised by the same pair in the same season. In the case of Nos. 4 and 9 (1931), the female retained the territory but had a different mate for each nest. None of the birds was banded but we became so familiar with the individual characteristics of the nesting pairs that we are sure of our statements. The strip along the west fence about 650 feet long by 120 feet wide, which comprised the territory of the pair owning nest No. 11 (1931), was evidently determined in shape by the attractiveness of the fence posts and wires as perches. One bird, the only one seen in connection with this nest, habitually used them as such. The adjoining field was short stubble of the previous year and some of the food supply was secured therein. It is probable that this same pair was also responsible for nest 5, but this nest was only discovered just as the young were ready to leave and neither the territorial boundaries nor the relations between the birds and the single adult, later seen at nest 11, were satisfactorily determined.

Nests 6 and 8 were of two separate pairs and so was the outlier from the main colony, nest No. 3, the territorial boundaries of which were not determined.

The territory of a pair to the north of nests 4 and 9 is interesting as it was clearly demarcated by the singing perches as indicated. The nest of this pair was not found.

The singing perches of the various males are denoted by X. It is interesting to note that where boundaries adjoined, there was a tendency to concentrate singing perches. This suggests that rivalry and defensive preparedness was a consideration but actually, between the territories of 6, 8 and 10, there was a clump of dwarf willows. It is more than likely that these desirable perches were a big factor in determining the shape and layout of territory. The same is true to a great extent of the other nesting pairs. The birds strictly observed the territorial boundaries; they are not pugnacious either between themselves or other species. The territories of savannah sparrows, chestnut-collared longspurs, western meadowlarks, short-eared owls and possibly Sprague's pipits all overlapped but the birds appeared to tolerate each other and lived peaceably together.

Nests and Nesting

SITUATION OF NESTS

The situation of Baird's sparrows' nests varies somewhat but is limited in the one respect of being always placed upon the ground amongst grass. For convenience of description they can be divided into three general types, although it must be borne in mind that this is an arbitrary classification and that the distinguishing characters may not be strictly adhered to from nest to nest.

First comes the type where the nest is placed in a tuft of grass which is usually held up by a wolfberry or other kind of shrub. The tuft is hollowed out, a floor of grass is added, and the sides are then built up with grass woven in and out sometimes to a height of five inches. In another type, the location is chosen beneath an overhanging, often horizontal, tuft of dead grass, leaving only a small entrance hole at the side. Frequently there is a slight depression underneath the tuft, but if none exists, a shallow one is made by the bird. In the third type, which seems to be the most common, the nest has no overhead concealment. Nests of this type are quite often situated in cavities—generally hoof marks—that in some cases are so deep as to place the nest two or three inches below ground level. If such a cavity is not utilized, however, a shallow excavation is made so that the nest is sunken to the level of the surrounding recumbent dead grass. Plate I shows a nest of this kind.

CONSTRUCTION OF NESTS

Differences in structure are only slight and depend largely upon the type of situation. In the first and second types the floor is composed of short lengths of dead grass laid down to form a sort of thick mat. This is surmounted by a rim of interwoven grass which varies in height, being high in the first case and low in the second. The entrance in the first type is fairly high up in the tuft, where the side is gradually pressed down by the birds in alighting and departing. In the second type the entrance is at ground level, is small, and is usually the only position from which the interior can be viewed. In the third case, if the nest is sunken in the ground, the same construction prevails. If, however, it be placed level with the ground, it is then a more substantial affair, being a bulky, well-woven, cup-like structure.

The average inside dimensions of a nest are: diameter, 2.5 inches; depth, 1.5 inches.

The variety of materials found in the nests is very limited. Dead grass is used almost exclusively, the lining often being of finer strands

than the rest. P. B. Peabody in North Dakota and Minnesota, and A. Dawes DuBois in Montana have found that weed stems were sometimes used. No similar observation has been made in our studies. In one nest

TABLE III. Data on Nidification

Nest No.	Date found	No. of Eggs	No. of Young	Date Hatched	Mortality	Date left nest	Remarks
0	June 29 1930	5	.....	.....	.....	.....	Collected June 29, 1930
1	July 5 1930	.....	3	.....	.....	July 6-7	
2	July 13 1930	6	6	July 26	2	Aug. 3	
3	July 28 1930	4	2	July 30	.....	Aug. 9-10	1 egg disappeared. 1 egg infertile
4	July 7 1931	3 1 cow- bird	3	July 12	.....	July 20	Cowbird's egg coll. July 8
5	July 22 1931	1 and 1	.....	.....	.....	July 23	1 egg infertile
6	July 26 1931	4	4	Aug. 5	.....	Aug. 14	
7	July 29 1931	.....	5	.....	1	July 30	1 yg. coll. for study purposes
8	Aug. 4 1931	.....	4	.....	4	.....	2 yg. coll. Aug. 5 2 yg. disap. Aug. 7
9	Aug. 11 1931	.....	4	.....	.....	Aug. 20	
10	Aug. 17 1931	.....	3	.....	.....	Aug. 21	
11	Aug. 18 1931	.....	5	.....	2	Aug. 21	2 young disap.
12	July 2 1932	6	.....	.....	.....	.....	Collected July 2, 1932
13	July 2 1932	4	.....	.....	.....	.....	Collected July 2, 1932
14	July 14 1934	5	.....	.....	.....	.....	Collected July 14, 1934
Totals ..		39	43		9		

Mortality (including human interference)..... 20.9 per cent
 Mortality (excluding human interference)..... 14.0 " "
 Number of young successfully reared to the stage of leaving nest..... 79.1 "

The incubation period was established as eleven days.

The averaged observed duration of young in the nest was nine days, the extremes being eight days and eleven days.

we have seen bits of a moss that grew sparsely in the vicinity. In the lining of two nests a few strands of horse hair were noticed. Another material often favoured where it could be obtained was the red setæ of moss, greatly resembling hair and possibly used for the same reason.

The life of the nest is very short, lasting only about three or four weeks. During the course of nesting it suffers greatly from the trampling of both parents and young. Moreover, when the young birds leave, it has been observed by us that the sides are broken down and the material of the nest strewn about so that traces of its existence are obliterated. This must necessarily be done by the parent birds.

The birds are exceedingly close sitters, even on fresh eggs, and will not flush until one is on top of them. One female (on fresh eggs) would even allow a light rope to be dragged over her without flushing. In consequence, the nest is extremely difficult to find. The fact that of the thirty-five nests which are recorded in Table VII, fifteen of them are ours, the balance being practically all the nests of this species which have been discovered in fifty-eight years, will tell the story of countless hours of searching much more graphically than any words.

There seems to be little variation in nesting habit or situation in any part of the breeding range. Thus, nests described to us by Dr. T. S. Roberts (North Dakota—3 nests), Dr. R. M. Anderson (North Dakota—1 nest), A. Dawes DuBois (Montana—2 nests), T. E. Randall (Alberta—4 nests), Rev. P. B. Peabody (Minnesota—1 nest and North Dakota—2 nests), Dr. Wm. Rowan (Alberta—1 nest) show no radical departure from those described.

Type of Nesting Cycle

Of five pairs of birds kept by the writers under constant observation, three are known definitely to have raised two broods in a season, while another pair is also thought to have done so. It is believed, therefore, that Baird's sparrows usually nest twice each year.

Two of the three pairs whose both nests were discovered had the same mates throughout the season. In both these instances, laying of the second set of eggs is believed to have been started not later than one day after the first brood of young left their nest.

In the one case observed where the males were changed for the second nesting, both male and female fed the young of the first nest until about the eleventh day after they had left the nest. During this interval, the new male mated with the female, and the new set of eggs was probably begun on the eighth day following the departure of the young from their nest.

It appears, then, that following the procedure described by Nice (1930), for the song sparrow, the nesting cycles overlap when the same birds mate for both nests, and are separate when a new mate is secured for the second nest.

DATE OF LAYING

At Winnipeg, egg-laying is not begun until the middle of June. In other parts of its range, however, nests have been found as early as June 5th.

INCUBATION

As mentioned in Table III, the duration of incubation has been found in one instance to be eleven days. No other observations on this point are known to exist. Incubation is performed entirely by the female, which leaves the eggs only for brief periods, at nearly all times returning secretly by mousing away through the grass. She is rarely seen during incubation except at the nest.

Eggs, especially large sets, usually lie in the nest in a definite arrangement. A set of six eggs lying in two rows of three each was several times shifted out of that position, and just as frequently it was returned by the bird to its original order.

During the first incubation period, the male bird passes the time in the vicinity of the nest, singing and feeding. Neither his voice nor his actions give any indication of the location of the nest, and even when it is in immediate danger of discovery his manner does not change.

EGGS

Five eggs are the normal clutch for Baird's sparrow although four is of frequent occurrence. Six eggs are occasionally found as evidenced by the nest found by A. Dawes DuBois in Teton Co., Montana, on July 16, 1916, the one found by one of us (R.D.H.) on July 13, 1930, a photo of which appears in Plate I and the nest with six eggs found (T.M.S.) on July 2, 1932, at the St. Charles nesting colony.

MEASUREMENTS

Eighteen eggs measured averaged 19.9 mm. x 14.9 mm. The extremes are:—Length, smallest 18 mm., longest 22 mm.; width, smallest 14 mm., largest 16 mm. These measurements agree well with those of five eggs measured by P. B. Peabody from a North Dakota nest.

COLOUR AND MARKINGS

The ground colour of the eggs is white, rarely showing a faint tinge of bluish. Reddish-brown spots and blotches showing a decided tendency to form a wreath about the larger end are the commonest markings. Occasionally there are small black spots and lilac or lavender markings, the latter being probably due to the obscuring of reddish-brown pigment by shell layers. The eggs are not easily distinguished from those of the savannah sparrow, which are very variable both in ground colour and markings, nor from those of the vesper sparrow, which they closely resemble. They are larger than the savannah sparrow's and smaller than the vesper sparrow's eggs as a rule.

HATCHING

The first indication of hatching is found in a slightly protuberant spot on the shell near its greatest circumference. Less than twenty-four hours after this has occurred, the young bird has freed itself from the egg by making a series of such perforations around the wall, and the pieces of shell have been removed from the nest by the parent. The eggs usually hatch early in the day.

In a set of three, four or more eggs, about one day elapses before all birds are hatched.

Young

DEVELOPMENT OF YOUNG

Young birds emerge from the egg clothed with long grey down. For the first day or two they lie prone in the nest with the head turned back toward the body. They are so weak that they can raise their heads to receive food only with difficulty. For two days after hatching the female broods occasionally in the daytime, for a period of about three minutes each time. During the night she appears to cover the young every night until they leave. On the fourth day the young birds begin to utter a faint peeping noise. By the fifth day they have acquired sufficient strength to be able to stand up in the nest when being fed. On this date they begin to use a "*taepe*" note as a food call.

Young Baird's sparrows depart from the nest on their eighth to tenth day. By then they are well feathered, wide awake, and active, although incapable of flight. They usually leave together, the struggling of the first bird being a sufficient stimulus to urge them all to action. They crawl rapidly away and hide themselves in the grass, where they are lost to view for the next few days.

By about the thirteenth day of their lives they are able to fly for a few yards. One bird at this stage was found lying in a small cup-like hollow almost like a nest. When they are about nineteen days old they have developed to the point where they begin to wander away from their parents' territory. At this time they begin to utter a thin "*seep*" which appears to be a flocking note. In the case of second broods, the young are accompanied in their wanderings by their parents, which have now deserted their territory.

FEEDING OF YOUNG

To observe nesting procedure closely, a blind was placed beside three nests at a distance of $2\frac{1}{2}$ feet. Though suspicious of any sound from within the blind, the birds did not resent this extremely close position; as soon as the blind was up, they would use it as a perch, and curiosity would often draw them close to inspect an unusual object.

The burden of providing food while the young are in the nest was found to rest largely on the female. Males, while helping a little, show individually varying degrees of interest in this phase of the work. After the young birds leave the nest, however, the male assumes the whole duty and leaves the female free to start a new nesting cycle. Feeding often takes place at the rate of a trip per minute, but occasional pauses of ten minutes or less bring the average down to a trip every 6.3 minutes, as the following table shows:

TABLE IV. Rate of Feeding

Duration of observations, in minutes	Number of young fed	Number of times food brought	Average interval between trips in minutes	Aver. number of insects brought each trip
881	11	157	6.3	1.19

A pair of Baird's sparrows would, on the average, collect 136 insects every 12 hours for their young. This would necessitate 115 trips, nearly all of them being made by the female. With 80 feet each way being taken as an average length of a trip, the bird would be required to fly only 18,400 feet—less than four miles—a day.

The insects, even the large grasshoppers which constitute a large portion of their food, appear to be fed whole. The feeding operation, performed with the characteristic rapidity of this species, consists simply of shoving the insect into the upstretched mouth of the young bird. If the bird does not swallow it promptly, it is taken away and given to another

one. Only one insect is given to a bird, and thus two or three may be fed at a single trip.

Careful attention is almost invariably paid to cleanliness in the nest. The exceptions are some late nests where only one parent is present, and this is possibly because the attending bird is the male. Faeces are usually carried away and dropped in flight, but sometimes they are eaten.

ACTIONS OF CAPTIVE YOUNG

To further test the extraordinary capacity of the young for grasshoppers, one of us (T.M.S.) assisted by Angus Shortt, caught a juvenile Baird's sparrow which had left the nest and was capable of a flight of fifty to one hundred feet. It was still being fed by one of its parents when captured. Its egg tooth was still present and tail feathers very short. All its other plumage had fully developed and was free of sheaths. Its call was a musically whistled "*tyeep*". It was not very tame but still not frightened or panicky, taking everything as it came. A large box was floored with turf and covered with screen netting. The experiment was conducted from 4.00 to 5.50 p.m. August 5, and from 8.00 a.m. to 10.00 p.m. August 6. Details follow:

4.00 p.m., Aug. 5. Fed it six medium to small sized grasshoppers, which it ate eagerly. After the sixth one it refused food. It then cleaned and groomed its feathers, applying the bill first to the oil gland and preening the primaries, scapulars, femoral tracts, dorsal tracts and tarsi. Slept intermittently until 4.15 p.m. when it was fed another medium-sized grasshopper. It quivered its wings when offered food. At 4.35 it ate two grasshoppers which it caught and consumed unassisted. It then slept for 15 minutes.

4.50 p.m. Awoke and took another grasshopper which it swallowed with difficulty, head first. Stretched wings and feet and went to sleep again.

4.58 p.m. Picked up a grasshopper by one leg and shook the body off, swallowing the leg; yawned and dozed again. On waking, yawned and stretched wings.

5.05 p.m. Looked about, stretched legs and cleaned flanks and underparts, fanned wings and ate another grasshopper leg, then slept again.

5.12 p.m. Stretched left wing and remained awake, taking great interest in all movements until 5.18, when it slept again.

5.21 p.m. Awoke and swallowed another grasshopper after several futile attempts during which it discovered that a grasshopper could not be swallowed from behind. Stood up at 5.27 and stretched left wing, then raised both wings over back and quivered them. Slept until 5.34 when it stood up and stretched right wing; sat down and watched every move-

ment; cleaned left flanks; yawned two or three times; stretched quite a bit and then picked up the eleventh grasshopper; called several times and swallowed a small grasshopper without difficulty. Six more grasshoppers which had been pinched at the thorax so as to render them inactive were put in with it at 5.50 p.m. After supper, when we returned, all six had been eaten. It was given five more in the evening. Ate four and picked at the other, killed it, but did not attempt to eat it. Twenty grasshoppers consumed in about eight hours.

Aug. 6. Awoke just before 5 a.m. and started to call—fed about eight a.m. and consumed two dozen grasshoppers before 10 a.m. Shortly after 10 a.m. escaped from cage and flew straight up to the tops of large oak trees nearby and made off into the woods. It was there until after 1.00 p.m. when it was recaptured. While free it perched in the tops of trees sometimes over thirty feet up and called incessantly. It was captured when a warbling vireo alighted on the tree beside it and came up to within six inches of it. The Baird's sparrow apparently took fright, swooped down and was secured in a butterfly net.

When recaged, called repeatedly for food and was given twenty more grasshoppers (15 small and 5 large). These were, for the most part, stunned, killed or crippled and the bird caught and ate them unassisted. The large ones were torn to pieces and devoured while the smaller ones were swallowed whole, head first. Usually the bird attempted to eat them abdomen first but was not successful and turned them around to head-first position when they were swallowed with little difficulty. The legs apparently could not be handled from behind. At 6.00 p.m. we noticed its food call again and brought in another collection of grasshoppers, 12 of which it ate before 10 p.m. These included two of the very large yellow variety which were eaten in pieces. At 10 p.m. it made a bed under the tallest tuft of grass in the cage, jumping and turning around under it until it had a comfortable nest-like hollow shaped, then backed into it. The head was placed between the scapular tract and inter-scapulars and the feathers folded over the beak, eyes and forehead. The back of the head was not covered.

Plumages

NATAL PLUMAGE

Newly hatched young of Baird's sparrow are clothed with pale smoky-grey down, this being longest and densest on the head (capital, tract). Down also shows along the spinal, humeral, alar (between the elbow and wrist) and femoral tracts. By way of contrast, the down of

the savannah sparrow is dull mouse-grey while that of the chestnut-collared longspur is whitish-grey to buffy-grey.

The skin is reddish-flesh colour, translucent (paler and less orange than the young savannah sparrow of the same age). The young are blind for the first three days of their lives but the eyelids begin to open on the third day in the case of the strongest and most vigorous of a nestful. Development is rapid, the remiges growing more quickly than any other feathers. The scapulars are slower in growth than other feathers until about the time the young are ready to leave the nest, when general feather growth appears to be retarded except the scapulars which continue to develop steadily.

COLOURS OF SOFT PARTS AND JUVENAL PLUMAGE

Newly hatched young have an arresting mouth pattern quite different from that of the savannah sparrow, Sprague's pipit, chestnut-collared longspur, and prairie horned lark. In fact the inner mouth patterns of the young nestlings of these species are all different from each other and are a reliable badge of identification. The roof of the mouth, tongue and lower mandible lining are translucent pale-carmine, with a greyish wash at the tongue's tip. The protuberant eyeballs show through the translucent upper lining as pale grey-blue spots for the first few days. The gape and outline of the mouth is a bright, pale naples-yellow. When four or five mouths suddenly flash open in the dark interior of the nest, the effect is quite startling. There can be little doubt that an adult arriving with food, whose eyes are in brilliant sunlight adaptation, finds the bright yellow outline of the gaping mouths of instant practical importance in the proper placing of the food. The eyelids of a young Baird's sparrow are dull lead-grey. Iris—rich dark brown; bill—pinkish-grey suffused along the culmen with brownish which intensifies as the young become older, lower mandible pale pink; tarsi, feet and claws—pale pink, translucent.

JUVENAL PLUMAGE

The juvenal plumage is as follows: loral region and forehead black sparsely tipped with buff; crown black tipped with buff, more buffy in the centre, showing an indistinct median line; superciliary line buff; auriculars buff tipped with black; malar region buff; nape and hindneck black edged with buff; back black edged with pale buff, giving a scaly appearance; rump black edged with ochraceous-buff; upper tail coverts and rectrices the same; scapulars black edged with buff, paler at the tips; primary and secondary coverts grayish black widely tipped with

buff; primaries and secondaries grayish black; throat and upper breast black widely edged with buff, the same pattern continuing along the sides; belly white tinged with buff, paler towards the vent; undertail coverts white; crural tract whitish with black centres. The general coloration of the juvenal is ochraceous buff about the head, a mixture of blackish and ochreous on the back giving a scaly appearance. The colours are more intense than any plumage of the adult and the breast and side markings are heavier.

ADULT PLUMAGE

"Top of head and nape a rich strong buff or brownish-yellow, striped with black, especially on sides of crown and nape; sides of head and neck pale buff, more or less flecked with black; a narrow line of black spots on side of throat; feathers of back dull black centrally margined with pale buff or greyish-white, producing a streaked appearance; rump lighter and more buffy; underparts white or pale buff on throat and breast; streaked on sides, flanks and across breast with black, the streaks on breast sharply defined and forming a necklace, those of the sides more diffuse and tinged with rufous; wing-feathers greyish-brown, the coverts darker centrally; tail dull brown or blackish, the outer feather on each side narrowly edged with white on outer web and pale, dull white terminally, suggesting a white outer tail-feather when seen by transmitted light; the other feathers narrowly tipped with dull white or buffy; bill, light flesh colour, darker at tip; legs flesh colour, feet darker; iris brown. The middle pair of tail feathers is much narrower and more pointed than others" (Roberts, *loc. cit.*).

Food and Feeding of Young

Our observations on feeding habits are confined to the breeding season and, with the exception of several adult stomach analyses, are limited to food supplied to the young, although adults have been observed to capture and eat grasshoppers.

Our astonishment was great when we found young birds but two days old being fed with unmodified grasshoppers. Not being familiar with the species of grasshoppers present in the breeding area, we classified them as small, medium and large in our notes. Later, specimens of the grasshoppers present in the area were collected and submitted to Mr. Norman Criddle, together with a moth and a cricket which were occasionally fed to the young. We are indebted to Mr. Criddle for the following identifications:

Orthoptera

Chorthippus curtipennis Harr.
Camnula pellucida Scud.
Arphia pseudonietana Thoms.
Melanoplus dawsoni Scud.
Melanoplus bivittatus Say.
Gryllus assimilis Fab.

Lepidoptera

Caenurgia erechtea Cram.

Mr. Criddle points out that *C. pellucida* and *M. bivittatus* are pests of economic importance.

It is of interest to note that, while the young are fed almost entirely on large grasshoppers, the food of adults in summer consists mainly of smaller insects. The examination of the stomachs of four adults reveals only one small grasshopper nymph, but many small items such as leafhoppers, spiders, moths and small seeds are present. It would seem that the adult, in searching for food for the young, consumes all the small insects it comes across which are not worthy of a trip back to the young. Thus the "by-products" of its search for food for the young are, in effect, a natural economy during the period when the demands on the adult are great.

TABLE V. Stomach analyses of Baird's sparrow

Date	Age	Sex	Locality	Contents of stomach
June 20/34	Ad.	♂	Gypsumville, Man.	1 leafhopper 40%, several small beetles 40%, 1 dipterous insect 20%, all badly masticated.
July 4/30	Ad.	♂	Deer Lodge, Winnipeg	Empty.
Aug. 5/31	Ad.	♂	St. Charles, Manitoba	Badly masticated remains of very small insects (Coleoptera, etc.) 100%.
Aug. 22/31	Ad.	♀	Deer Lodge, Winnipeg	3 leafhoppers 25%, 1 spider sp.? 10%, wing of very small moth 5%; some grasshopper eggs (about contents of 1 ♀) 10%; about 100 small seeds (probably timothy) 50%.
Aug. 22/31	Im.	♀	St. Charles, Manitoba	2 fully grown long-horned grasshoppers (1 containing 6 eggs) 75%; at least 3 leafhoppers 25%.

Voice

Several writers have stated that Baird's sparrow's song resembles that of the savannah sparrow. Coues (1873a) and Thompson (E. Thompson-Seton) (1891) both make this rather misleading statement and it has been reiterated in most general bird lists. As a matter of fact the song of Baird's sparrow is quite characteristic. The resemblance, if any, is only of slight degree. In the 5th Edition of Coues' "Key to North American Birds" (1903), he says: "The song is peculiar, of two or three tinkling notes and a trill 'Zip-zip-zip-z-r-r-r-r'." It is evident that he revised his opinion of the resemblance originally fancied.

A phonetic rendering of the song is difficult. Coues gives one example quoted above. Seton renders it thus: "*trick-e-trick-etrick-eeee-chiky-le-roit*". DuBois (1931) gives a number of different examples describing variables in the song. A sample noted July 19, 1916, runs "*stick-sti-stipper-ster-ree-e-e-e*".

The authors kept separate records of songs and when brought together we found that each had adopted a different phonetic rendering. For instance, B.W.C. records a typical song thus: "*stee-stee-stee-stee-ell-l-l-l-l-l-l*". T.M.S. renders the same song "*Kee-ki-ki-ki-kee-l-l-l-l-l-l-l*", while R.D.H. has it "*Si-si si si si ulllll*". The opening notes are distinct, not unmusical but possessing the buzzy quality usually associated with grass sparrows' songs. The following trill, almost a warble, is clear, mellow, pure in tone and quite musical. So much so, that it stamps Baird's sparrow as the best singer of all the grass sparrows known to us. The opening notes are higher in pitch than the trill, the difference being from a half to a full tone. The opening notes are frequently changed in pitch but the trill is rarely altered from start to finish. A connecting note between the opening syllables and the trill is usually a semi-tone and as the season advances there is a tendency to reduce the number of opening notes. In all, we recorded 29 different, recognizable songs. Most of these were characteristic of individuals.

With regard to progressive change in song, the following statement is made with reserve, being more a general impression than the result of particular study. The song first heard on the breeding territory lacks the power and enthusiasm which becomes evident a few days later. It may be described as the territory occupation song. The arrival of the females is judged to be responsible for the decided increase in vigour and frequency of song which takes place and which may be described as the mating song. This remains fairly constant until the young hatch and then there is a falling off in frequency of utterance and enthusiasm. This is probably due to the fact that the male takes over the care of the young

while the female starts to build up a clutch of eggs for the second brood. After a lapse of a few days the song again increases in vigour and frequency. It now diminishes more quickly than it did before and ceases quite abruptly about the end of July and is but rarely heard in August even though the females are still incubating. The last song heard was on August 17 (T.M.S.). The female does not sing.

Apart from the song, we noted that when a male and female went down into the grass together, a gentle "*meer-r-r*", described as a whining or murmuring noise, was heard. It is assumed that copulation took place on some of these occasions but this was not actually observed. This note was heard mostly from the male but the female was heard to use it on one occasion. The alarm note of both sexes is a monotonous "*chip*" repeated at regular intervals from a perch; not so rapid as the alarm note of the savannah sparrow, from which it is distinguished only after considerable experience. When the female is in the grass close to the nest she may get excited enough to utter a rapid "*chittering*" but usually she retired to a perch. When a person intrudes into a male's territory, his song appears to acquire greater vigour and is uttered more frequently and in this way the female is probably warned of approaching danger.

The duration of the song, as timed, is two to three seconds.

Baird's sparrow will sing from the ground, a tuft of grass, a stake, fence or perch in dwarf willow or wolfberry. It has no flight song and only twice was it heard to sing while on the wing. The favourite singing perches are in tufts of wolfberry. It points its bill to the zenith, delivers the opening notes and then follows the trill, its throat pulsating very noticeably.

The song is strong enough to be heard, under favourable conditions, a distance of two hundred and fifty yards. Under ideal conditions for audibility, the attentive ear can detect it up to three hundred and fifty yards but at this distance only the trill can be heard.

When the birds are in full song there is only a pause of from ten to fifteen seconds between each outburst.

On July 29, 1931, at 3.55 a.m., with the moon still shining and only a red glow on the eastern horizon heralding the rising sun, chestnut-collared longspurs, savannah sparrows and Baird's sparrows began to sing. It was noticed that Baird's sparrow did not sing more vigorously at dawn than at other times. It also sings after sunset when it is dusk.

Utterances noted during this study are as follows:

1. Song with its variations. Uttered most frequently during mating, egg-laying, and incubation periods. Given less frequently when young are in nest and only occasionally when young are out of nest. If a second nest is started, however, male begins singing strongly again a few days after the young leave the nest.

2. A low murmuring note, "*meeerr meeerr meeerr*". Used by male during courtship and in this case is accompanied by a fluttering of the wings; may be given in flight. Used by female when nest is in danger. Is then a note of anxiety. Used also by male during breeding season.

3. A sharp "*kee-kee-keep*". Used mostly when male and female come together, also rarely when nest is visited. May be a note of anger or annoyance.

4. Two alarm notes. A sharp "*chip*" that cannot be distinguished from a similar note of the savannah sparrow; and a lower, woodeny "*chup*" used mostly by the male. These notes are used only when the nest or young are in danger. If the danger seems slight, the male uses the second note, but if it is immediate, he changes to the first.

5. Young birds in the nest utter a faint peeping, especially when begging for food. As the birds grow older, the note becomes louder.

6. "When a young bird was taken out of the nest to be examined, it uttered a sudden, sharp, screaming note. At this, one of the remaining two young left the nest, crawled rapidly away, and hid itself in the grass." (July 20, 1931.)

7. A musical "*tip*" uttered by young birds about 8 days old (nest No. 7). A "*taepe*" uttered by those of nest No. 8 at about the same age. These also uttered the "*chup*" of the adults.

8. Juvenile birds, and adults later in the summer, utter a high-pitched, wing "*seep*" note, identical with the same type of call of the savannah, and perhaps a flocking note.

9. Young of nest No. 9 imitated the parent's "*chip*" when 6 days old.

Environment

The relations of Baird's sparrow to its environment are such that we are led to believe that it is one of the irreconcilables. It is doubtful whether it will ever be able to adjust itself to cultivated land. Just why this is we cannot say, but we do not find them on cultivated land, and this seems to be generally true from the reports of other observers from the breeding range. The only apparent reason for the wholesale desertion of the St. Charles territory was that same had been mown in the fall of 1930. They seem to get along all right on land which is being grazed but if it is mown, burnt over or cultivated, it is rendered unsuitable to them. It was noticed that sections of the Deer Lodge territory burnt in the spring of 1931, were given a wide berth by breeding birds even though a good growth of grass had made its appearance there by the time the birds were ready to breed. They are birds of the native prairie, just as much as are the upland plover, chestnut-collared longspur and Sprague's pipit. All these species are found breeding in the same areas and all seem to be equally intolerant of changes wrought by man.

Some of the more common prairie plants found in the breeding territory are listed below. We are indebted to Chas. W. Lowe, M.Sc., of the University of Manitoba, for the identifications.

Agropyron tenerum—Slender wheat grass
Grindelia squarrosa—Gum-weed

Solidago canadensis—Canada golden-rod
Solidago hispida—Hairy golden-rod
Artemisia gnaphalodes—Prairie sage
Panicum virgatum—Wild red-top grass
Hordeum jubatum—Squirrel-tail grass
Aster commutatus—Small white prairie aster
Poa arida—Prairie bunch grass
Mentha canadensis—Wild mint
Agrostis hyemalis—Rough hair grass
Salix longifolia—Sand-bar willow
Symporicarpus occidentalis—Wolfberry.

The avian associations of Baird's sparrow have been referred to throughout the text. The only other birds which entered their lives were the marsh hawk (*Circus hudsonius*), kingbird (*Tyrannus tyrannus*) and the clay-coloured sparrow (*Spizella pallida*). None of them interfered with Baird's sparrow in any way. The reaction to the passage of a marsh hawk was merely for a singing male to hop down into the concealing wolfberry or grass and wait until the danger had passed. We never saw one fall victim to a marsh hawk. Munro (1929) records finding a beheaded juvenile Baird's sparrow at a marsh hawk's nest at Sullivan Lake, Alta., on July 22, 1926.

Where the birds of this district secured drinking water was quite a puzzle as there was no available water nearer than at least a mile. Throughout July and August the place was as dry as a bone, particularly in 1931 when drought conditions prevailed. The birds were never seen to leave the breeding territories. We found, however, that heavy dews were of almost nightly occurrence and this was apparently their only source of supply. They must get along with very little water, however, as the blazing, cloudless days, with temperatures between eighty and one one hundred degrees Fahrenheit, did not seem to inconvenience them or their young in any way.

Parasites

The young were carefully examined from time to time for external parasites but we failed to find any. With one exception (nest 11) all the nests were kept scrupulously clean. It was astonishing to find no trace of *Mallophaga*—our search for them became quite intense as the nesting season drew to a close—but we were forced to conclude that Baird's sparrow is extraordinarily free from external parasites of any kind. It may be remarked here that in preparing seven adult and three juvenile specimens taken during the course of this study, we also failed to find any parasites, either external or internal.

Social Parasitism

Friedmann (1929) records but two instances of Baird's sparrow as a victim of the cowbird:—"Walter Raine (Bird Nesting in Northwest Canada, Nidiologist, I, no. 5, Jan. 1894, p. 71), reports a nest of Baird's sparrow containing three eggs of the cowbird and two of its own. Mr. Alfred Eastgate informs me that he found a cowbird's egg in a nest of this species."

To the above we can add two records as follows:—Dr. T. S. Roberts (*in litt.*) "Northern Sargent County, North Dakota, June 18, 1883; 4 eggs of the sparrow (Baird's) and two of the cowbird, nearly fresh."

Nest 4 found by one of us (R.D.H.) July 7, 1931, at Deer Lodge, Winnipeg, Manitoba, contained three eggs. On July 8 a cowbird's egg had been added and was removed the same day by the observer. The Baird's clutch of three remained intact and hatched on July 12, hence were about half incubated when the cowbird's egg was deposited. This was the first nest found in 1931 and as we had no assurance that we would find any more we planned extensive observations on the nest. Had we known that we would have the good fortune to find seven more nests during the season we would have allowed the cowbird's egg to remain and would have learned the reactions of Baird's sparrow to this social parasite. A blind was erected at this nest—within three feet—and at 4.50 p.m. on July 14 the following observation was made by one of us (R.D.H.)—"There was a rustle in the grass near the blind and a female cowbird appeared. It inspected the blind but came to within only two feet of the nest. Then it walked to the long grass by the side of the ditch. Just then, the female Baird's sparrow appeared, flew to nest and fed the young with a grasshopper and another unidentified insect. When I looked for the cowbird it was not visible—it had hidden in the grass. The Baird's sparrow now flew to the top of blind. From its elevated position it saw the cowbird and flew at it. The cowbird flew away pursued by the sparrow. The Baird's sparrow then returned to the nest and settled on it to brood." It left the nest again at 5.00 p.m.

It is not improbable that this was the same female cowbird that had deposited the egg in the nest on July 8 and possibly had returned to lay a second egg.

Our experience, therefore, borne out by other available breeding records, is that Baird's sparrow is not a frequent victim of the cowbird. Its habit, in our district at least, of nesting late in the season may be a factor in its partial immunity, but cowbirds do not seem to be as numerous in the open prairie as they are in the wooded sections. The cowbird under discussion here is the Nevada cowbird (*Molothrus ater artemisiae*), according to Dr. Herbert Friedmann.

Summary

Baird's sparrow (*Ammodramus bairdi*) was discovered near the mouth of the Yellowstone river, North Dakota, on July 26th, 1843, by Audubon and party.

Twenty-nine years elapsed before the species was again encountered by ornithologists. G. E. Aikin re-discovered it near Fontaine, El Paso Co., Colorado, on Oct. 9, 1872. Coues definitely established the breeding ground in North Dakota in 1873 and the same year Henshaw found them abundant on migration in Arizona.

The known breeding range has its limits at about 53 degrees north latitude in Manitoba, Saskatchewan and Alberta south to eastern Montana, North Dakota, north-western South Dakota, western Minnesota. The breeding territory is restricted to dry upland prairie immediately adjoining sloughs, marshes and lakes.

The winter range is obscure but appears to lie chiefly in the northern provinces of Mexico—Sonora, Chihuahua and Coahuila. Three records come from the southern borders of these provinces and the main wintering territory may lie south of them.

The spring migration is through Arizona, New Mexico and Colorado. The fall migration returns by the same route with a slight western shift taking in eastern Montana and Nebraska. In Arizona and New Mexico it is found at high altitudes in the fall.

Baird's sparrow nests on the ground amongst prairie grass. Three to six eggs constitute a clutch with five the normal. The incubation period is eleven days. The young stay in the nest for an average of nine days. Both male and female take part in feeding the young, the female predominantly while the young are in the nest, the male after the young leave. Two broods are reared in the season. The second clutch is built up from one to six days after the young leave the first nest, but the building of the second nests starts, in some cases, before the young leave. The same birds remain mated for both nests as a rule, but in one case the female retained the breeding territory and changed mates for the second clutch. The breeding season extends from the first week in June to the last week in August, varying somewhat in different parts of its range. There are no May breeding records.

Only the male sings. The song is distinctive and is characterized by one to five short buzzy notes followed by a trill a full tone lower in pitch. It is musical, fairly loud and can be heard for two hundred and fifty yards. The trill carries farther than the opening notes and can be heard up to three hundred and fifty yards. Baird's sparrow is the most pleasing singer of the sharp-tailed sparrows found on the prairies.

Forty young were observed in eleven nests. Of these, thirty-one were successfully brought to the point where they left the nest. Of the nine casualties, three were collected for scientific purposes, hence, the mortality percentage excluding human interference was 14 per cent.

No external parasites were found on the young or adults, and no internal parasites were found in seven adult and three juvenile specimens examined.

The breeding territory of individuals is quite large, roughly, an area of 62,000 square feet.

Baird's sparrow is an associate of the savannah sparrow, chestnut-collared longspur, Sprague's pipit and western meadowlark. It is only likely to be confused with the savannah sparrow. It is readily distinguished by its pale greyish appearance at ordinary observing distances, its lack of abrupt change of contour between bill and forehead which gives it a "low brow" appearance, and the necklace effect of its breast markings.

Grasshoppers comprise the bulk of the food brought to the young. No vegetable matter was fed to them in 157 observed instances of feeding, but in 79 instances the food was unidentified. Of the identified food, 97.80 per cent. was grasshoppers, 1.11 per cent. moths and 1.09 per cent. green larvae.

TABLE VI
LIST OF SPECIMENS IN VARIOUS PUBLIC AND PRIVATE COLLECTIONS

Collection	Sex	Age	Locality	Date
Acad. Nat. Sci.	F	..	Roswell, New Mexico.....	Jan. 13, 1929
Am. Mus. Nat. Hist.	M	Ad.	Bonita Canon, Arizona..... (5,000 ft. Chiricahua Mts.)	Feb. 5, 1919
	M	Ad.	Bonita Canon, Arizona.....	Feb. 8, 1919
	F	Ad.	" " "	Feb. 8, 1919
	M	Ad.	" " "	Feb. 8, 1919
	F	Ad.	Nuvancha Plain, N. Chihuahua, Mexico.	Feb. 13, 1892
H. S. Swarth.	M	Ad.	Huachuca Plains, Arizona.....	Feb. 17, 1903
Carnegie Mus.	M	..	Conchise, Ariz.....	Feb. 21, 1903
	M	..	" "	Feb. 21, 1903
	M	..	" "	Feb. 21, 1903
	M	..	" "	Feb. 22, 1903
	M	..	" "	Feb. 22, 1913
Mus. Comp. Zool.	M	..	Camp Huachuca, Ariz.....	Feb. 24, 1887
	M	..	Conchise, Ariz.....	Feb. 24, 1093
H. S. Swarth.	M	Ad.	Huachuca Plains, Ariz.....	Mar. 14, 1903
	F	Ad.	" " "	Mar. 16, 1903
N. M. and L. B. Nice	..	..	Northwest Arkansas.....	Mar. 23, 1914

TABLE VI—*continued.*

Collection	Sex	Age	Locality	Date
H. S. Swarth.....	F	Ad.	Huachuca Plains, Ariz.....	Mar. 24, 1903
	F	Ad.	" " "	Mar. 26, 1903
	F	Ad.	" " "	Mar. 29, 1902
	F	Ad.	" " "	Mar. 29, 1902
	M	Ad.	" " "	Mar. 29, 1902
	M	Ad.	" " "	Mar. 29, 1902
	M	Ad.	" " "	Mar. 29, 1902
Mus. Comp. Zool...	M	..	" " "	Mar. 29, 1902
	F	..	Conchise Co., Ariz.....	Mar. 29, 1902
H. S. Swarth.....	F	Ad.	Huachuca Plains, Ariz.....	Mar. 30, 1902
Los. Angeles Mus...	F	..	" " "	Apr. 1, 1902
H. S. Swarth.....	M	Ad.	" " "	Apr. 1, 1902
	M	Ad.	" " "	Apr. 1, 1902
	M	Ad.	" " "	Apr. 1, 1902
	F	Ad.	" " "	Apr. 1, 1902
	M	Ad.	" " "	Apr. 5, 1902
	F	Ad.	" " "	Apr. 5, 1902
	F	Ad.	" " "	Apr. 6, 1902
	F	Ad.	" " "	Apr. 6, 1902
	M	Ad.	" " "	Apr. 6, 1902
	F	Ad.	" " "	Apr. 17, 1902
	F	Ad.	" " "	Apr. 21, 1902
	F	Ad.	" " "	Apr. 21, 1902
	M	Ad.	" " "	Apr. 21, 1902
	F	Ad.	" " "	Apr. 22, 1902
	F	Ad.	" " "	Apt. 22, 1902
	M	Ad.	" " "	Apr. 23, 1902
U. S. Bio. Surv....	M	..	Pendennis, Kansas.....	Apr. 25, 1897
Am. Mus. Nat. Hist.	M	Ad.	Rio Grande City, Texas.....	Apr. 25, 1880
Allan Brooks.....	..	..	Rodeo, New Mexico.....	Apr. 29, 1913
	..	..	" " "	Apt. 29, 1913
	..	..	" " "	Apr. 29, 1913
	..	..	" " "	Apr. 29, 1913
British Museum....	..	Ad.	49th parallel.....	June 12, 1874
Royal Ont. Museum Zool.....	M	Ad.	Gypsumville, Manitoba.....	June 20, 1934
Mus. Comp. Zool...	M	..	Rio Grade City, Texas.....	Apr. 30, 1880
	M	..	Larson, North Dakota.....	May 5, 1925
U. S. Nat. Mus.....	M	Ad.	El Paso Co., Colo.....	May 6, 1873
B. J. Olsen.....	M	..	Kearney, Buffalo Co., Neb.....	May 6, 1914
U.S. Bio. Surv.....	F	..	Saltillo, Coahuila, Mex.....	May 8, 1902
Nat. Mus. of Can...	..	..	Davidson, Sask., Canada.....	May 8, 1928
F. H. Kennard.....	M	..	Rock Lake, North Dakota.....	May 9, 1895
Mus. Comp. Zool...	M	..	Rock Lake, North Dakota.....	May 9, 1895
A. M. Brooking....	M	..	Overton, Dawson Co., Neb.....	May 16, 1901
Nat. Mus. Canada..	..	..	Whitewater Lake, Manitoba.....	May 18, 1925

TABLE VI—*continued.*

Collection	Sex	Age	Locality	Date
J. A. Munro.....	M	Ad.	Lake Johnston, Sask.....	May 18, 1922
Field Mus. Nat. H..	M	..	Lake Johnston, Sask.....	May 19, 1925
F. H. Kennard.....	M	..	Rock Lake, North Dakota.....	May 19, 1895
Colo. Coll. Mus.....	F	..	Limon, Lincoln Co., Colo.....	May 20, 1899
Sask. Prov. Mus.....	..	..	Herbert, Sask.....	May 24, 1928
A. C. Bent.....	M	..	Carrington, North Dakota.....	May 24, 1909
Mus. Comp. Zool...	M	..	Carrington, North Dakota.....	May 24, 1909
	M	..	Red Lake, North Dakota.....	May 26, 1895
Field Mus. Nat. H..	M	..	Carrington, North Dakota.....	May 27, 1909
Sask. Prov. Mus....	..	..	Imperial Beach, Sask.....	May 28, 1924
Nat. Mus. of Can...	..	..	Cypress Lake, Sask.....	May 28, 1921
Sask. Prov. Mus....	..	..	Arm River, Sask.....	May 29, 1920
W. Rowan.....	..	..	Beaverhills Lake, Alta.....	May 29, 1923
Royal Ont. Mus. Z..	M	Ad.	Indian Head, Sask.....	May 30, 1903
Mus. Vert. Zool....	M	..	Wheaton, Minn.....	May 30, 1929
Univ. of Calif.....	..	..	Towner Co., North Dakota.....	May 31, 1890
Mus. Camp. Zool...	M	..	Sullivan Lake, Alta.....	June 4, 1924
	M	..	Sullivan Lake, Alta.....	June 5, 1924
P. B. Peabody.....	F	Ad.	Hallock, Kittson Co., Minn.....	June 7, 1898
W. E. Saunders....	..	..	High River, Alta.....	June 9, 1903
Mus. Comp. Zool...	M	..	Rock Lake, North Dakota.....	June 12, 1895
Univ. Minn. Zool...	M.F	Ad.	North Sargent Co., North Dakota.....	June 13, 1883
F. H. Kennard.....	M	..	Rock Lake, North Dakota.....	June 17, 1895
Nat. Mus. of Can...	..	..	Kutawagon Lake, Sask.....	June 18, 1920
Univ. Minn. Zool...	M.F	Ad.	North Sargent Co., N. Dakota.....	June 18, 1883
Sask. Prov. Mus....	..	..	Kutawagon Lake, Sask.....	June 20, 1917
Roy. Ont. Mus. Zool	M	Ad.	Kutawagon Lake, Sask.....	June 20, 1917
Mus. Comp. Zool...	F	..	Red Lake, North Dakota.....	June 21, 1895
U.S. Nat. Mus.....	F	Ad.	Rock Lake, North Dakota.....	June 24, 1895
A. C. Bent.....	M	..	Crane Lake, Sask.....	June 25, 1906
F. H. Kennard.....	M	..	Rock Lake, North Dakota.....	June 25, 1895
U.S. Bio. Surv.....	M	..	Streeter, North Dakota.....	June 28, 1912
Nat. Mus. of Can...	..	..	Milk River, Long. 112°, Alberta, Canada.	June 30, 1927
S. F. Rathbun.....	..	..	Neepawa, Man., Canada.....	June 00, 1889
Mus. Comp. Zool...	M	..	Big Muddy Creek, North Dakota.....	July 2, 1873
	M	..	" " " " "	July 2, 1873
U.S. Nat. Mus.....	M	Ad.	" " " " "	July 2, 1873
H. M. Laing.....	M	..	Oak Lake, Manitoba.....	July 7, 1921
	M	..	Oak Lake, Manitoba.....	July 7, 1921
Mus. Comp. Zool...	M	..	Hearst River, Dakota Terr.....	July 7, 1873
S. S. Visher.....	..	..	Harding Co., South Dakota.....	July 12, 1910
U.S. Nat. Mus.....	M	Ad.	20 Miles West of Pembina Mountains, North Dakota.....	July 14, 1873
	F	Ad.	20 Miles West of Pembina Mountains, North Dakota.....	July 14, 1873
	M	Ad.	20 Miles West of Pembina Mountains,	

TABLE VI—*continued.*

Collection	Sex	Age	Locality	Date
*U.S. Nat. Mus....			North Dakota.....	July 14, 1873
	M	Juv.	20 Miles West of Pembina Mountains, North Dakota.....	July 14, 1873
	M	Ad.	20 Miles West of Pembina Mountains, North Dakota.....	July 14, 1873
Am. Mus. Nat. Hist.	M	Ad.	20 Miles West of Pembina Mountains, North Dakota.....	July 14, 1873
Nat. Mus. of Can...	..	..	Deer Creek, Alta.....	July 14, 1927
Am. Mus. Nat. Hist.	M	Ad.	50 Miles West of Pembina Mountains, North Dakota.....	July 15, 1873
U.S. Nat. Mus....	M	Ad.	50 Miles West of Pembina Mountains, North Dakota.....	July 15, 1873
	M	Ad.	50 Miles West of Pembina Mountains, North Dakota.....	July 15, 1873
	M	Ad.	50 Miles West of Pembina Mountains, North Dakota.....	July 15, 1873
Nat. Mus. of Can...	..	..	50 Miles West of Pembina Mountains, North Dakota.....	July 15, 1873
Univ. Minn. Mus...	F	Ad.	Northern Sargent Co., N.D.....	July 15, 1883
U.S. Nat. Mus....	?	Juv.	20 Miles West of Pembina Mountains, North Dakota.....	July 16, 1875
	M	Ad.	50 Miles West of Pembina Mountains, North Dakota.....	July 16, 1873
Carnegie Mus....	M	..	50 Miles West of Pembina Mountains, North Dakota.....	July 16, 1873
Am. Mus. Nat. Hist.	M	Ad.	50 Miles West of Pembina Mountains, North Dakota.....	July 16, 1873
Nat. Mus. of Can...	..	..	Oak Lake, Man.....	July 16, 1921
Carnegie Mus....	F	..	75 Miles West of Pembina Mountains, North Dakota.....	July 17, 1873
Nat. Mus. of Can...	..	..	Red Deer River, Near Rumsey, Alta.....	July 17, 1925
Am. Mus. Nat. Hist.	M	Ad.	Maple Creek, Sask.....	July 17, 1906
	M	Ad.	“ “ “	July 17, 1906
	M	Ad.	“ “ “	July 17, 1906
	M	Ad.	“ “ “	July 18, 1906
	M	Ad.	“ “ “	July 18, 1906
Roy. Ont. Mus.Zool.	M	Ad.	St. James, Winnipeg, Man.....	July 20, 1929
Am. Mus. Nat. Hist.	M	Ad.	Maple Creek, Sask.....	July 21, 1906
Acad. Nat. Sci....	..	..	Huron, Dakota Territory.....	July 22, 1881
	..	..	Huron, Dakota Territory.....	July 23, 1881
U.S. Bio. Surv....	M	..	Napoleon, North Dakota.....	July 23, 1915
	M	..	Napoleon, North Dakota.....	July 23, 1915
Roy. Ont. Mus.Zool.	M	Ad.	Sullivan Lake, Alta.....	July 23, 1926
J. A. Munro.....	M	Ad.	Sullivan Lake, Alta.....	July 23, 1926
*U.S. Nat. Mus....	..	..	(Fort Union, Nebraska), Mouth of Yel- lowstone River, North Dakota.....	July 26, 1843

TABLE VI—*continued.*

Collection	Sex	Age	Locality	Date
Acad. Nat. Sci.....	M	M	Faulk Co., South Dakota.....	July 28, 1881
Acad. Nat. Sci.....	M	..	Walworth Co., South Dakota.....	July 29, 1881
U.S. Bio. Surv.....	F	..	Steele, North Dakota.....	July 29, 1893
	M	Ad.	" " "	July 29, 1893
	F	..	" " "	July 29, 1893
I. N. Gabrielson....	..	..	Berthold Ind. Res., North Dakota.....	July 29, 1918
S. G. Jowett.....	..	..	Sentinel Buttes, North Dakota.....	July 29, 1918
U.S. Bio. Surv.....	F	Imm	Steele, North Dakota.....	July 30, 1893
Allan Brooks.....	..	..	Dollard, Sask.....	July 00, 1930
Mus. Comp. Zool...	M	..	Walworth Co., South Dakota.....	Aug. 1, 1885
J. H. Fleming.....	F	Ad.	Lake Johnston, Sask.....	Aug. 1, 1921
W. H. Williams....	M	Ad.	Turtle Mountains, N.D.....	Aug. 3, 1930
U.S. Bio. Surv.....	F	..	Leeds, North Dakota.....	Aug. 3, 1893
	M	..	Devils Lake, North Dakota.....	Aug. 4, 1893
	M	..	Sentinel Buttes, N. Dakota.....	Aug. 4, 1913
	M	..	Dorsey, New Mexico.....	Aug. 4, 1913
B. W. Dartwright..	M	Ad.	Deer Lodge, Winnipeg, Man.....	Aug. 4, 1930
A. H. Shortt.....	M	Juv.	" " " "	Aug. 5, 1931
	M	Ad.	" " " "	Aug. 6, 1931
	M	Imm	" " " "	Aug. 7, 1931
U.S. Bio. Surv.....	F	..	Animas Mts. (North slope of Animas Peak, 5,800 ft.), New Mexico.....	Aug. 7, 1908
Acad. Nat. Sci.....	M	..	Medium Creek, North Dakota.....	Aug. 7, 1881
	M	..	Hand Co., South Dakota.....	Aug. 8, 1881
	..	..	Walworth Co., South Dakota.....	Aug. 9, 1881
U.S. Nat. Mus.....	F	Ad.	Souris River, North Dakota.....	Aug. 9, 1873
	..	Imm	" " " "	Aug. 9, 1873
	..	Ad.	" " " "	Aug. 9, 1873
	..	Imm	" " " "	Aug. 9, 1873
Field Mus. N.H....	..	..	" " " " .....	Aug. 9, 1873
U.S. Nat. Mus.....	F	Ad.	" " " "	Aug. 10, 1873
U.S. Bio. Surv.....	F	..	Animas Valley (Grey Ranch, 5,000 ft.), New Mexico.....	Aug. 10, 1908
	F	..	Pecos Baldy (12,000 ft.), New Mexico ..	Aug. 11, 1903
	M	..	Koehler, New Mexico.....	Aug. 12, 1913
	M	..	Lostwood, North Dakota.....	Aug. 12, 1915
	F	..	Lostwood, North Dakota.....	Aug. 12, 1915
U.S. Nat. Mus.....	..	Imm	Souris River, North Dakota.....	Aug. 13, 1873
	..	Imm	" " " "	Aug. 13, 1873
	..	Juv.	" " " "	Aug. 13, 1873
Field Mus. N. H....	..	..	" " " " .....	Aug. 13, 1873
Nat. Mus. of Can...	..	..	Lake Johnston, Sask.....	Aug. 14, 1920
J. H. Fleming.....	M	Juv.	Elmore Lake, Sask.....	Aug. 15, 1922
U.S. Nat. Mus.....	M	Ad.	Bowie Agency, Arizona.....	Aug. 16, 1874
Colo. Coll. Mus....	..	..	Gila River, Arizona.....	Aug. 16, 1876
U.S. Bio. Surv.....	M	..	Lostwood, North Dakota.....	Aug. 16, 1915

TABLE VI—*continued.*

Collection	Sex	Age	Locality	Date
Mus. Comp. Zool...	M	...	Near Sasabe, Mexico.....	Aug. 20, 1884
U.S. Nat. Mus.....	F	Juv.	Camp Grant, Arizona.....	Aug. 22, 1874
Coll. Coll. Mus.....	...	...	Colorado Springs, Colo.....	Aug. 22, 1897
	...	...	Colorado Springs, Colo.....	Aug. 22, 1897
A. H. Shortt.....	F	Ad.	Deer Lodge, Winnipeg, Man.....	Aug. 22, 1931
	F	Imm	St. Charles, Winnipeg, Man.....	Aug. 22, 1931
Nat. Mus. of Can...	...	...	Last Mountain Lake, Sask.....	Aug. 23, 1920
J. A. Munro.....	...	Juv.	Watertown, Sask.....	Aug. 14, 1923
Nat. Mus. of Can...	...	...	Oak Lake, Man.....	Aug. 26, 1921
Colo. Coll. Mus....	...	...	Gila River, Arizona.....	Aug. 28, 1876
	M	...	Colorado Springs, Colo.....	Aug. 29, 1916
J. A. Munro.....	M	Juv.	Lake Johnston, Sask.....	Aug. 29, 1921
*Coll. by Wm. Brewster.....	M	Ad.	Arizona, near Sasabe, Mex.....	Aug. 29, 188
	M	Ad.	Arizona, near Sasabe, Mex.....	Aug. 30, 188
*Coll. by F. Stephens	...	...	Sasabe, Sonora, Ariz. Bord.....	Aug. ?, 1884
	...	...	Sasabe, Sonora, Ariz. Bord.....	Aug. ?, 1884
*Coll. by H. Behrens	...	...	Western South Dakota.....	Sept. 1, 1900
U.S. Bio. Surv....	F	...	Las Vegas (7,200 ft.), N.M.....	Sept. 2, 1903
	F	...	Las Vegas (7,200 ft.), N.M.....	Sept. 2, 1903
	F	...	Deming, New Mexico.....	Sept. 2, 1908
S. S. Visher.....	...	...	Harding Co., South Dakota.....	Sept. 3, 1912
Acad. Nat. Sci.....	F	...	Neuvo Casas Grandes, Chihuahua, Mex..	Sept. 4, 1901
A. H. Shortt.....	F	Ad.	Deer Lodge, Winnipeg, Man.....	Sept. 4, 1931
U.S. Bio. Surv.....	M	...	Hopewell (9,900 ft.) N.M.....	Sept. 7, 1904
Nat. Mus. Can.....	...	...	Elrose, Sask.....	Sept. 7, 1920
U.S. Bio. Surv.....	M	...	Dorsey, New Mexico.....	Sept. 8, 1913
Aczd. Nat. Sci.....	F	...	Nuevo Casas Grandes, Chihuahua, Mex..	Sept. 8, 1901
Colo. Coll. Mus....	...	...	Colorado Springs, Colo.....	Sept. 9, 1897
	...	...	Colorado Springs, Colo.....	Sept. 11, 1897
U.S. Nat. Mus.....	M	Juv.	Mount Graham, Arizona.....	Sept. 11, 1873
U.S. Bio. Surv.....	M	...	Parral, Chihuahua, Mexico.....	Sept. 12, 1898
U.S. Nat. Mus.....	F	Ad.	Whitewater, Mexican Boundary Line ..	Sept. 13, 1893
	F	Ad.	“ “ “ ..	Sept. 13, 1893
	F	Ad.	“ “ “ ..	Sept. 13, 1893
Mus. Comp. Zool...	M	...	Graham's Island, North Dakota.....	Sept. 16, 1903
Colo. Coll. Mus....	...	...	Colorado Springs, Colo.....	Sept. 17, 1897
	...	...	“ “ “ ..	Sept. 19, 1897
	“ “ “ ..	“
U.S. Nat. Mus.....	...	Juv.	Papillion, Nebraska.....	Sept. 19, 1882
U.S. Bio. Surv.....	M	...	Roswell, New Mexico.....	Sept. 21, 1902
U.S. Nat. Mus.....	M	Juv.	Mount Graham, Arizona.....	Sept. 21, 1873
J. H. Fleming.....	M	Ad.	Mount Graham, Arizona.....	Sept. 21, 1873
U.S. Nat. Mus.....	M	Juv.	Camp Grant, Arizona.....	Sept. 22, 1873
Mus. Comp. Zool...	M	Juv.	“ “ “ ..	Sept. 22, 1873

TABLE VI—*continued.*

Collection	Sex	Age	Locality	Date
Am. Mus. Nat. Hist.	F	Imm	Camp Grant, Arizona.....	Sept. 22, 1873
Carnegie Mus.....	M	..	" " "	Sept. 23, 1873
	M	..	" " "	Sept. 23, 1873
U.S. Bio. Surv.....	M	..	Balleza, Chihuahua, Mex.....	Sept. 23, 1895
	M	..	Balleza, Chihuahua, Mex.....	Sept. 23, 1895
	F	..	Ancho, New Mexico.....	Sept. 23, 1903
Colo. Coll. Mus.....	..	..	Colorado Springs, Colo.....	Sept. 24, 1897
	..	..	" " " .....	Sept. 24, 1897
	..	..	" " " .....	Sept. 24, 1897
	..	..	" " " .....	Sept. 24, 1897
	..	..	" " " .....	Sept. 24, 1897
	..	..	" " " .....	Sept. 24, 1897
	..	..	" " " .....	Sept. 24, 1897
	..	..	" " " .....	Sept. 24, 1897
Am. Mus. Nat. Hist.	M	Ad.	Camp Grant, Arizona.....	Sept. 24, 1878
U.S. Bio. Surv.....	M	..	Balleza, Chihuahua, Mex.....	Sept. 25, 1895
Colo. Coll. Mus.....	..	..	Colorado Springs, Colo.....	Sept. 26, 1897
	..	..	" " " .....	Sept. 26, 1897
	..	..	" " " .....	Sept. 26, 1897
	..	..	" " " .....	Sept. 26, 1897
U.S. Bio. Surv.....	F	..	Warfield, Texas.....	Sept. 27, 1902
	F	..	Stanton, Texas.....	Sept. 29, 1902
U.S. Nat. Mus.....	M	Juv.	Camp Grant, Arizona.....	Sept. 29, 1873
	M	Juv.	" " "	no date
	M	Juv.	" " "	no date
Coll. by E.S. Cameron	..	..	Custer Co., Montana.....	Sept. —, 1893
Coll. by D.H. Talbot	..	..	O'Neill, Nebraska.....	Sept. —, 1884
Calif. Acad. Sci.....	F	Ad.	San Rafael Valley, Santa Cruz Co., Arizona.....	Oct. 1, 1927
U.S. Nat. Mus.....	F	Ad.	Animas Valley, New Mexico.....	Oct. 2, 1893
	F	Ad.	" " "	Oct. 2, 1893
	M	Ad.	" " "	Oct. 2, 1893
Coll. by E.R. Warren	..	..	Near Valentine, Nebraska.....	Oct. 2, 1912
Mus. Comp. Zool...	M	..	Chihuahua (Chihuahua), Mexico.....	Oct. 2, 1888
	M	..	Chihuahua (Chihuahua), Mexico.....	Oct. 2, 1888
Williams Coll.....	..	..	North Dakota.....	Oct. 7, 1914
Colo. Coll. Mus.....	..	..	Colorado Springs, Colo.....	Oct. 8, 1898
U.S. Nat. Mus.....	M	..	El Paso Co., Colo.....	Oct. 9, 1872
Calif. Acad. Sci.....	F	..	San Rafael Valley, Santa Cruz Co., Arizona.....	Oct. 10, 1927
Colo. Coll. Mus.....	..	..	El Paso Co., Colorado.....	Oct. 10, 1897
	..	..	" " " .....	Oct. 10, 1897
	..	..	" " " .....	Oct. 10, 1897
	..	..	" " " .....	Oct. 13, 1897
	..	..	" " " .....	Oct. 13, 1897
	..	..	" " " .....	Oct. 13, 1897

TABLE VI—*continued.*

Collection	Sex	Age	Locality	Date
Am. Mus. Nat. Hist.	F	..	Gila River, Arizona.....	Oct. 16, 1873
H. S. Swarth	F	Ad.	Huachuca Plains, Arizona.....	Oct. 24, 1907
	M	Imm	Huachuca Plains, Arizona.....	Oct. 24, 1907
A. H. Helme, Coll..	..	Juv.	Montauk Point, Long Island, New York.	Nov. 13. 1899

*Type Specimen of J. J. Audubon.

TABLE VII
ACTUAL BREEDING RECORDS

Date	Locality	Eggs and No. of Young or Incubation	Authority
June 5, 1919	Benson Co., North Dakota ..	5 fresh.....	P. B. Peabody
June 7, 1898	Hallock, Kittson Co., Minn...	4 fresh, F. taken..... with ripe egg in uterus	P. B. Peabody
June 9, 1931	Francis Pt., Beaverhills Lake, Alta.....	4 fresh.....	Wm. Rowan
June 10, 1905	North Alberta ?.....	5 fresh.....	E. Thompson
June 10, 1928	Benson Co., North Dakota ..	4 well begun.....	P. B. Peabody
June 13, 1883	Sargent Co., North Dakota ..	— partly incub. F. taken	T. S. Roberts
June 13, 1904	North Alberta.....	4 fresh.....	E. Thompson
June 15, 1899	Petersberg, Nelson Co., North Dakota.....	5 about half, F. taken..	R. M. Anderson
June 18, 1883	Sargent Co., N. Dakota.....	4 plus 2 cowbird's eggs.	T. S. Roberts
June 20, 1925	Castor, Alta.....	5	T. E. Randall
June 21, 1925	“ “	5 slight.....	T. E. Randall
June 23, 1925	“ “	5 advanced.....	T. E. Randall
June 24, 1895	Rock Lake, N. Dakota ..	5	Elmer T. Judd
June 26, 1924	Castor, Alta.....	5 young, half-grown...	T. E. Randall
June 29, 1930	St. Charles, Winnipeg, Man..	5 on point of hatching..	T. M. Shortt
July 1, 1873	Big Muddy Creek, N.D.....	4 (first nest known)...	J. A. Allen
July 2, 1932	St. Charles, Winnipeg, Man..	6 eggs incub. advanced.	T. M. Shortt
July 2, 1932	St. Charles, Winnipeg, Man..	4 eggs, fresh.....	T. M. Shortt
July 5, 1930	Deer Lodge, Winnipeg, Man.	3 young, eyes open....	R. D. Harris
July 7, 1891	Cando, Tower Co., N. Dak..	5 eggs.....	Elmer T. Judd
July 7, 1931	Deer Lodge, Winnipeg, Man.	3 plus 1 cowbird's egg..	R. D. Harris
July 13, 1930	Deer Lodge, Winnipeg, Man.	6 eggs, fresh.....	R. D. Harris
July 14, 1934	Headingly, Man.....	5 eggs, slight incub....	T. M. Shortt
July 15, 1883	Sargent Co., N. Dakota.....	— nearly fresh, F. taken.	T. S. Roberts
July 16, 1916	Teton Co., Montana.....	6 eggs, far advanced...	A. Dawes DuBois
July 22, 1916	Teton Co., Montana.....	4 two days.....	A. Dawes DuBois
July 22, 1930	W. Pennington Co., Minn....	2 fresh.....	T. S. Roberts
July 22, 1931	Deer Lodge, Winnipeg, Man.	1 egg and 1 young....	R. D. Harris

TABLE VII—*continued*

Date	Locality	Eggs and No. of Young or Incubation	Authority
July 26, 1931	Deer Lodge, Winnipeg, Man.	4 eggs.....	R. D. Harris
July 28, 1930	" " "	4 eggs, near hatching ..	R. D. Harris
July 29, 1931	" " "	5 young nearly ready to leave.....	R. D. Harris
Aug. 4, 1931	" " "	4 young ready to leave.	R. D. Harris
Aug. 11, 1931	" " "	1 pipped egg and 3 young newly hatched.	T. M. Shortt
Aug. 17, 1931	" " "	3 young with feathers just breaking through sheaths.....	R. D. Harris
Aug. 18, 1931	" " "	5 young about 4 days old.....	R. D. Harris

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CARTWRIGHT, ET AL—NEST AND EGGS IN SITUATION, DEER LODGE, WINNIPEG,
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(Photo by A. G. Lawrence)



CARTWRIGHT, ET AL—NESTING HABITAT OF BAIRD'S SPARROW AT DEER LODGE,
MANITOBA. THE DOG IS A SCALE TO THE HEIGHT OF THE GRASS AND
SNOWBERRY.

(Photo by A. H. Shortt)

